

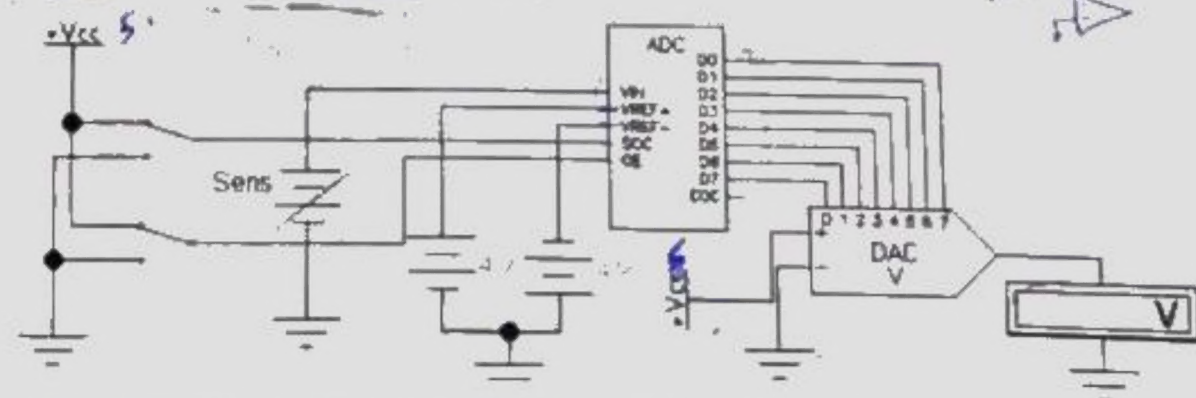
Q1) Temperature sensor sensitivity is $0.42\text{mA}/^\circ\text{C}$, used for temperature range $(\pm 50^\circ\text{C})$. Design signal condition circuits for bipolar (8 bit) ADC with voltage reference $\pm 3\text{V}$.

- a) What is the digital output of ADC at the temperature 31°C , -20°C
 b) What is the temperature when the digital output is B6H. [10 pts]

Q2) Design the signal conditioning circuits to connect the sensor to 8 bit ADC with voltage reference $(0-10\text{V})$, where: sensor output range $(-100 - +100\text{ mV})$ with frequency 25Hz . Noise signal 20mV with frequency 260Hz , and using filter that Attenuate the noise signal to 29% of its value, and taking in account the effect of the filter on the sensor signal. [10 pts]

Q3) Using pressure sensor which sensitivity is $2.3\text{mV}/\text{bar}$, and temperature sensor which sensitivity is $10\Omega/^\circ\text{C}$ and its value at zero $^\circ\text{C} = 300\Omega$. Design circuit which open Valve when the pressure is more than 15bar , and operate heater when temperature is less than 20°C , and operate Red LED when both of them are ON. [10 pts]

Q4) What is the digital value of the ADC output and what is the analog value of DAC output at the temperature 23°C , and -30°C . Where sensor sensitivity $= 15\text{mV}/^\circ\text{C}$, sensor output at $0^\circ\text{C} = 100\text{mV}$, sensor range $= \pm 50^\circ\text{C}$. [10 pts]



256 128 64 32 16 8 4 2 1

Fall 2017

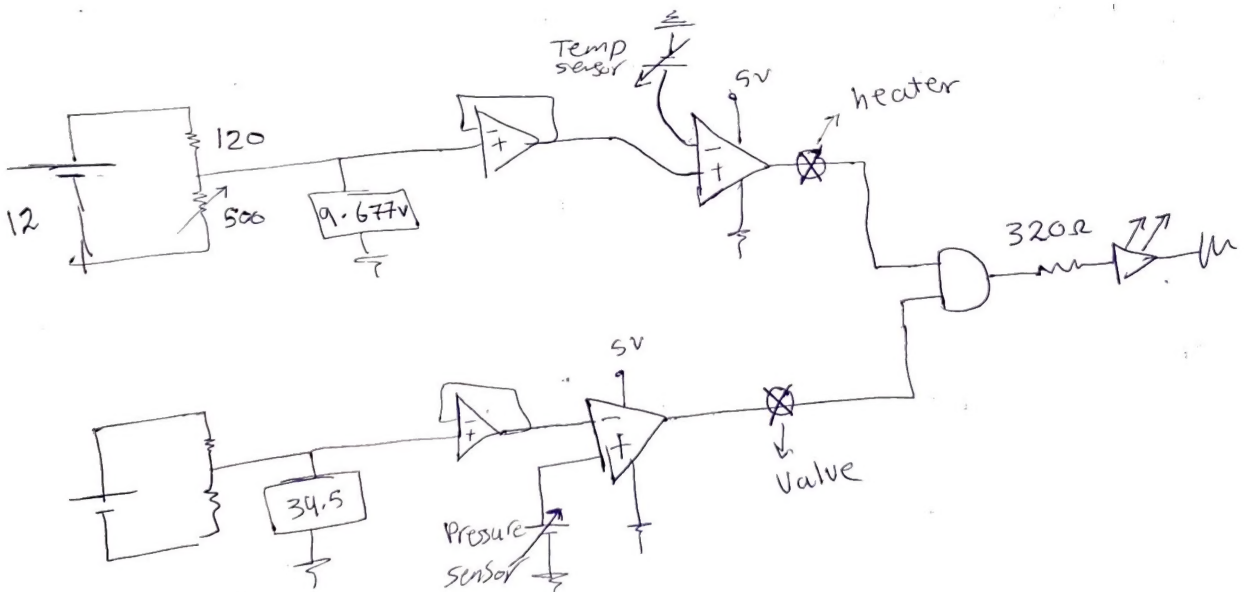
2nd Exam

Q3 - Pressure sensor sensitivity is $2.3 \frac{mV}{bar}$
 Temp " " is $10 \frac{\Omega}{^{\circ}C}$ @ $0^{\circ}C = 300 \Omega$

- * Open Valve when $P > 15 bar$,
- * operate heater " $T < 20^{\circ}C$,
- * Red led when both ON.

- $15 bar \times 2.3 \frac{mV}{bar} = 34.5 mV$

- $(20^{\circ}C \times \frac{10 \Omega}{^{\circ}C}) + 300 \Omega = 500 \Omega$



A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

$R_{Red} = \frac{5 - 1.8V}{10mA} = 320 \Omega$